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EXAMINER	
SHAH, PARAS D	

ART UNIT	PAPER NUMBER
2626	

NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)
	10/722,285	SHRIVASTAV, RAHUL
	Examiner	**Art Unit**
	PARAS SHAH	2626

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *04 June 2009*.

2a)☒ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-11,13-21,23-54 and 56-58* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3-11,13-21,23-54 and 56-58* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This communication is in response to the Arguments filed on 11/12/2010. Claims, 1, 3-11, 13-21, 23-54, 56-58 are pending and have been examined, with claims 56-58 being newly added, and claim 55 being cancelled. The Applicant's arguments and amendments have been considered, but they do not place this case in condition for Allowance.

2. All previous objections and rejections directed to the Applicant's disclosure and claims not discussed in this Office Action have been withdrawn by the Examiner.

Continued Examination Under 37 CFR 1.114

3. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 11/12/2010 has been entered.

Response to Arguments

4. Applicant's arguments with respect to claims 1, 3-11, 13-21, and 23-54 have been considered but are not persuasive for the reasons noted below.

With respect to the 35 USC 103 rejection of claims 1, 3-5, 11, 13-15, 21, -23-25, and 31-51, the Applicant argues that Bayya does not teach a method of diagnosing

voices. The Examiner respectfully disagrees with this assertion. In response to applicant's arguments, the recitation “diagnosing voices” has not been given patentable weight because the recitation occurs in the preamble. A preamble is generally not accorded any patentable weight where it merely recites the purpose of a process or the intended use of a structure, and where the body of the claim does not depend on the preamble for completeness but, instead, the process steps or structural limitations are able to stand alone. See *In re Hirao*, 535 F.2d 67, 190 USPQ 15 (CCPA 1976) and *Kropa v. Robie*, 187 F.2d 150, 152, 88 USPQ 478, 481 (CCPA 1951). Furthermore, the diagnosing of voice for evaluation of voice quality is a diagnosis. Dictionary.com defines diagnosis to be “a determining or analysis of the cause or nature of a problem or situation.” Hence, in the case for voice, determining or analyzing of voice, such as evaluation to determine if the quality of voice is sufficient. Thus, Bayya teaches this type of system, where scores are computed to determine the quality of speech (see col. 2, lines 7-9).

The Applicant argues on page 3, Bayya does not process a voice signal. The Examiner respectfully disagrees with this assertion. Bayya, in col. 2, lines 50-52 describes the input of the corrupted speech signal into a processor 12 for further processing. Hence, Bayya does process the corrupted speech signal. The specific processing taught by the secondary reference of Treurniet teaches the processing being done by a peripheral ear processor. Treurniet describes in col. 12, lines 40-41 and col. 4, lines 30, where a processed signal is processing in a peripheral ear processor. This can be applied to determine testing of networks (i.e. communication systems). Hence,

the use of the peripheral ear processor in Treurniet in the system of Bayya enables improvement in audio signal quality evaluation based on perceptual qualities of speech (see Treurniet, col. 2, lines 19-21).

The Applicants argue in page 3, last paragraph, Bayya does not identify one or more attributes of said processed voiced signal but rather generates distortion. The Examiner respectfully disagrees with this assertion. As stated above, Bayya, in col. 2, lines 50-52, describes the processing of the corrupted speech signal. Treurniet was relied upon for the processing of the processed signal using the peripheral ear model. Bayya then teaches the identification of the attributes in col. 4, for example, where the cepstral values of y(n) and x(n) is determined, speech reference and corrupted speech respectively. The Applicant's Specification, in [0027] describes the voice quality attributes to be "including, but not limited to, low frequency periodic energy in the test voice signal, high frequency aperiodic energy in the test voice signal, partial loudness of a periodic signal portion of the test voice signal, as well as the combination of noise in the test voice signal and partial loudness of the test voice signal." Hence, the Applicant presents a broad definition of what the attributes are. Further, the attributes are determined for the reference and corrupted speech respectively.

The Applicants argue on page 4, 1st paragraph that Bayya does not teach comparing said one or more voice quality attributes of said voice signal with one or more baseline vocal quality attributes…." The Examiner respectfully disagrees with this assertion. Bayya does teach the comparison of voice quality attributes between said voice signal and a baseline signal. This is described in col. 4, equation 6. The attribute

of cepstral values are compared for each coefficient to determine the closeness. The result is a measure. Thus, Bayya compares attributes of the corrupted speech signal and the speech reference signal. The Applicants argue that the claims are relevant to a speech signal prior to being sent over the communication system to diagnose the voice. In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., prior to being sent over the communication system) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

The Applicants on page 4, 2nd paragraph argue that there would be no suggestion or motivation for Bayya in view of Treurniet to combine with the roughness measure taught by Deal when Bayya is interested in measuring the quality of corrupted speech in a voice communication system. The Examiner disagrees with this assertion. In col. 4, lines 53-55, Bayya describes the dimensions that the quality of speech should represent. In one of these dimensions, the intelligibility and naturalness of speech is listed. Hence, Bayya suggests that the distortion measure includes evaluation of the quality in terms of naturalness. Deal discloses a method of determining vocal roughness. Further, in page 250, Deal describes the measurement of roughness enabling vowel quality to be determined in a speech signal. Hence, the combination of Bayya in view of Treurniet enables individual components of the speech signal to be

further analyzed. Although Bayya relates to distortion caused by a communication system, Bayya also suggests the naturalness of speech to be analyzed.

The Applicants on page 4, last paragraph-page 5, continued, assert that Deal does not teach the breathiness and strain. The Examiner respectfully disagrees with this assertion. The reference of Deal was not relied upon for these limitations. Hillenbrand was cited for this limitation as denoted on page 16 and 17 of the last office action. Further, Hajitodorov was cited to teach the strain. Hence, Deal does teach the attributes as in claim 1 and 3, since "at least one" from the group listed is required.

The applicants in the first full paragraph of page 5 assert that the Office Action doe snot provide any explanation as to how Bayya would be motivated to incorporate the teachings of Deal. The Examiner respectfully disagrees with this assertion in view of the prior reasons provide, two paragraphs above. Further, the Examiner provided reasoning in the Final Action on page 7 of the Action. Further, it is the determination of speech quality with respect to hoarseness produced from vowels that is being incorporated in Bayya. Furthermore, Bayya provides a suggestion and teaching for measuring the quality of speech, in terms of naturalness and intelligibility in col. 4, lines 53-55. Further, Deal teaches the specific evaluation of quality in terms of perception or naturalness (see Deal page 250, 1st paragraph).

The Applicants on page 6, 1st full paragraph assert that Bayya has no motivation to process a voice signal using an auditory model since Bayya is interested in measuring how speech is corrupted in a communication system. The Examiner respectfully disagrees with this assertion. Although Bayya may be interested in

measuring how speech is corrupted in a communication system, the motivation to have included an auditory model was provided by the secondary reference on Treurniet. Specifically, the peripheral ear model of Treurniet enables improvement in audio signal quality evaluation based on perceptual qualities of speech (see Treurniet, col. 2, lines 19-21). The secondary reference of Treurniet provides an improvement over the quality assessment of Bayya by basing the evaluation on perceptual qualities. Further, Treurniet, in col. 12, lines 40-41, describes the teachings being used to determine quality of communication networks.

The Applicants on page 6, last paragraph-page 7, 1st paragraph, assert that Bayya does not teach the identifying step in the claim since Bayya teaches the determining of the amount of distortion. The Examiner respectfully disagrees with this assertion. Bayya teaches the identifying of one or more attributes. In col. 4, lines 25-26, cepstral values for the corrupted speech and reference speech are used for comparison to determine a cepstral distance. This comparison is then used to determine a measure of voice quality. This is described in col. 4, lines 25-26 and col. 5, lines 62, where a score is determined. The Applicants mention the term caused by a communication system, however, the present claims do not restrict such quality being evaluated prior to a communication system not being influenced by a communication system. Furthermore, the processes signal using an auditory model was relied upon by Treurniet. The voice signal and reference vector's attributes are compared in Bayya, in equation 6 of col. 4, cepstral values.

The Applicants on page 7, 2nd paragraph assert that Bayya does not identify and then compare the quality attributes. The Examiner respectfully disagrees with this assertion in view of the above reasoning. The identification occurs in Bayya from the cepstral values that are to be used prior to comparing the two cepstral values in col. 4, lines 25-26. The reference and corrupted speech are not compared but rather the attributes of these signals.

The Applicants on page 7, last paragraph-page 8, assert that one measure limited to roughness, hoarseness, strain, and breathiness is occurring. Bayya determines the distortion and not the measures indicated. The Examiner respectfully disagrees with this assertion. The Applicant further asserts that the claims relate to determining of a voice measure "without regard as to whether the voice signal went through a communication system." However, the examiner notes that the claims do not recite such a limitation. Further, with respect to the first assertion, Bayya teaches determination of a measure of distortion. In col. 4, lines 53-55, Bayya teaches the distortion having a dimension of naturalness and intelligibility. Deal further teaches measuring and determining roughness and hoarseness (see page 251, 4th paragraph and 2nd paragraph). Further, the Published Specification by the applicant also describes the determining of quality of a voice signal after transmission through a communication channel. Thus, similar to Bayya.

The Applicants on page 8, 1st full paragraph assert that the Office Acton does not provide any explanation that the distortion could be compared to anything. However, Bayya teaches comparing *cepstral values* of the corrupted speech signal and the

reference signal not the distortion as noted by the Applicant, as the values are used to determine the distortion measure.

The Applicants on page 8, 1st full paragraph assert that the “quality of speech" is different than the "voice quality." The examiner respectfully disagrees with this assertion. In paragraph, [0012], of the Applicants Published Specification describes voice quality to be defined in terms of perceptual consequence of the acoustic signal. This quality In Bayya is the same. Bayya uses the quality of speech to be assessed by considering naturalness and intelligibility, which are all perceptual in nature.

The applicants on page 9, 1st two full paragraphs, assert that there would have been no motivation to process a voice signal using a peripheral ear model of Treurniet since Bayya is interested in measuring how speech is corrupted in the speech communication system. The Examiner respectfully disagrees with this assertion. The use of the peripheral ear model of Treurniet provides an improvement of the quality measure as described in Bayya. Specifically, the perceptual quality of speech can be realized as described in col. 2, lines 36-37 of Treurniet. Furthermore, Treurniet is also applicable to a communication system. This is described in col. 12, lines 39-43, where quality testing if audio is done in communication networks. Also, the inputs into the peripheral ear model are a processed signal or corrupted signal and a reference signal, which is unprocessed (see col. 4, lines 29-33). Hence, it is possible to process the original speech signal with the auditory model. Bayya indicates several dimensions in evaluating voice quality. This is naturalness, intelligibility, background noise and the sensitivity to distortion. Hence, Bayya uses a non-linear model to determine the scores

for quality of speech. Although, Bayya is using distortion to measure quality of speech, Bayya is considering other modes that affect the quality of speech. Further, in col. 3, and col. 4, the equations show various distortion measures. The measures are not simply the difference between two signals but based on various measures.

Hence, the Applicant's arguments have been considered and are not persuasive.

Claims 6-10, 16-20, 26-30, and 56-58are rejected for similar reasons as those mentioned above.

Furthermore, a new 35USC 101 rejection has been made on claims 21, 23-30, and 58 upon further consideration of the claim scope of "computer readable storage."

Claim Rejections - 35 USC § 101

5. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 21, 23-30, 47-54, and 58 are drawn to a "signal" per se as recited in the preamble and as such is non-statutory subject matter. On paragraph [0018] of the Published Specification, the term "computer readable storage" is not defined as to what the scope of the term is meant to encompass. Hence, one of ordinary skilled in the art can interpret such term to include transitory signals and non-transitory signals. It does not appear that a claim reciting a signal encoded with functional descriptive material falls within any of the categories of patentable subject matter set forth in § 101. First, a claimed signal is clearly not a "process" under § 101 because it is not a series of steps. The other three § 101 classes of machine, compositions of matter and manufactures

"relate to structural entities and can be grouped as 'product' claims in order to contrast them with process claims." 1 D. Chisum, Patents § 1.02 (1994).

The Applicant's Specification presents a broad definition as to what the "computer readable storage" covers and is being made to include transitory and non-transitory signals. The Applicant's Published Specification in paragraph [0018], refers to the "machine readable storage". However, the specification does not define what the machine readable storage encompasses nor does it mention as to what the "computer readable storage encompasses". Hence, it appears that the claims appear to be drawn towards transitory signals, which is not subject matter eligible. In order to overcome the present rejection, the Applicant is advised to amend the claims by using the following terminology: "non-transitory machine readable storage medium." Such example terminology has been also found in the Official Gazette 1351 OG 212.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. **Claims 1, 3-5, 11, 13-15, 21, 23-25, and 31-54** are rejected under 35 U.S.C. 103(a) as being unpatentable over BAYYA et al. (US 6,446,038) in view of TREURNIET et al. (Patent No.: US 7,164,771) in view of DEAL et al. ("Some Waveform and Spectral Features of Vowel Roughness").

8. Regarding **claim 1**, BAYYA teaches a method of diagnosing voices comprising:

processing a voice signal (“receives an input corresponding to the corrupted speech signal”, BAYYA, column 2, lines 49-50) (e.g. The speech signal corresponds to a speaker's voice from whom it was uttered);

identifying one or more voice quality attributes of said voice signal by analyzing said processed voice signal (“generates corresponding signals 18 representing the amount of distortion in the corrupted speech signal for each of the plurality of distortion measure utilized”, BAYYA, column 3, lines 21-24 and col. 3-4, equations 1-6, power spectra, LPC, cepstral values are calculated in order to calculate distortion measure) (e.g. The speech signal corresponds to a speaker's voice from whom it was uttered, where attributes of the speech signal are identified);

comparing said one or more voice quality attributes of said voice signal with one or more baseline vocal quality attributes derived from at least one baseline voice signal values (see col. 3, lines 1-8 and see equation 6 using these cepstral values to determine a distortion measure) in order to determine at least one measure of vocal quality of the voice signal (see BAYYA, columns 3-4, equations 1-6 and see col. 4, lines 53-59, where the speech quality is evaluated in several dimensions including naturalness)

However, BAYYA does not disclose using an auditory model.

In the same field of field of quality measurement, TREURNIET teaches processing a voice signal using an auditory model to produce a processed voice signal

("peripheral ear processor 22 that processes signals according to a peripheral ear model", TREURNIET, column 4, lines 24-25).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use the peripheral ear model of TREURNIET to process the input received by BAYYA in order to better estimate how the signal will be perceived (see TREURNIET, column 2, lines 19-22).

However, BAYYA in view of TREURNIET do not disclose wherein each of the at least one measure of vocal quality are selected from the group consisting, of roughness hoarseness strain, and breathiness.

In the same field of speech quality measurement, DEAL discloses a method of measuring vocal roughness. DEAL teaches a measure of voice quality that is at least one of roughness and hoarseness ("provide a quantitative acoustic index predictive of perceived vowel roughness", DEAL, p. 251, 4th paragraph, where vowel roughness is associated with voice roughness and hoarseness, see DEAL, p. 251, 2nd paragraph).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use the measurement method of DEAL as one of the distortion measures of BAYYA in order to increase the versatility of the quality measurement by determining vowel quality contained in a speech signal (see DEAL, page 250, last three lines of 1st paragraph), which would benefit the teachings of Bayya, which also suggests the determination of the naturalness of a speech signal. The incorporation of Deal enables the naturalness of individual components of the

speech signal to be further analyzed for possible variability among speakers (see Deal page 250, Abstract).

9. Regarding **claim 11**, BAYYA teaches a system for diagnosing voices comprising:

process a voice signal voice signal (“receives an input corresponding to the corrupted speech signal”, BAYYA, column 2, lines 49-50) (e.g. The speech signal corresponds to a speaker's voice from whom it was uttered);

identify one or more voice quality attributes of said voice signal by analyzing said processed voice signal (“generates corresponding signals 18 representing the amount of distortion in the corrupted speech signal for each of the plurality of distortion measure utilized”, BAYYA, column 3, lines 21-24 and col. 3-4, equations 1-6, power spectra, LPC, cepstral values are calculated in order to calculate distortion measure) (e.g. The speech signal corresponds to a speaker's voice from whom it was uttered, where attributes of the speech signal are identified);

compare said one or more voice quality attributes of the voice signal with one or more baseline vocal quality attributes derived from at least one baseline voice signal quality attributes values (see col. 3, lines 1-8 and see equation 6 using these cepstral values to determine a distortion measure) in order to determine at least one measure of vocal quality of said voice signal (see BAYYA, columns 3-4, equations 1-6)

However, BAYYA does not disclose using an auditory model.

In the same field of field of quality measurement, TREURNIET teaches process a voice signal using an auditory model to produce a processed signal (“peripheral ear

processor 22 that processes signals according to a peripheral ear model", TREURNIET, column 4, lines 24-25).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use the peripheral ear model of TREURNIET to process the input received by BAYYA in order to better estimate how the signal will be perceived (see TREURNIET, column 2, lines 19-22).

However, BAYYA in view of TREURNIET do not disclose wherein each of the at least one measure of vocal quality are selected from the group consisting, of roughness hoarseness strain, and breathiness.

In the same field of speech quality measurement, DEAL discloses a method of measuring vocal roughness. DEAL teaches a measure of voice quality that is at least one of roughness and hoarseness ("provide a quantitative acoustic index predictive of perceived vowel roughness", DEAL, p. 251, 4th paragraph, where vowel roughness is associated with voice roughness and hoarseness, see DEAL, p. 251, 2nd paragraph).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use the measurement method of DEAL as one of the distortion measures of BAYYA in order to increase the versatility of the quality measurement by determining vowel quality contained in a speech signal (see DEAL, page 250, last three lines of 1st paragraph), which would benefit the teachings of Bayya, which also suggests the determination of the naturalness of a speech signal. The incorporation of Deal enables the naturalness of individual components of the

speech signal to be further analyzed for possible variability among speakers (see Deal page 250, Abstract).

10. Regarding **claim 21**, BAYYA teaches a machine readable storage, having stored thereon a computer program having a plurality of code sections executable by a machine for causing the machine to perform the steps of:

processing a voice signal (“receives an input corresponding to the corrupted speech signal”, BAYYA, column 2, lines 49-50) (e.g. The speech signal corresponds to a speaker's voice from whom it was uttered);

identifying one or more attributes of said voice signal by analyzing said processed voice signal (“generates corresponding signals 18 representing the amount of distortion in the corrupted speech signal for each of the plurality of distortion measure utilized”, BAYYA, column 3, lines 21-24 and col. 3-4, equations 1-6, power spectra, LPC, cepstral values are calculated in order to calculate distortion measure) (e.g. The speech signal corresponds to a speaker's voice from whom it was uttered, where attributes of the speech signal are identified);

comparing said one ore more voice quality attributes of said voice signal with one or more baseline vocal quality attributes derived from at least one baseline voice signal values (see col. 3, lines 1-8 and see equation 6 using these cepstral values to determine a distortion measure) in order to determine at least one measure of vocal quality of said voice signal (see BAYYA, columns 3-4, equations 1-6),

However, BAYYA does not disclose using an auditory model.

In the same field of field of quality measurement, TREURNIET teaches processing, via the computer (see col. 12, lines 28, implemented using a computer systems and see col. 3, lines 3-5, system is implemented in a computer), a voice signal using an auditory model to produce a processed voice signal ("peripheral ear processor 22 that processes signals according to a peripheral ear model", TREURNIET, column 4, lines 24-25).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use the peripheral ear model of TREURNIET to process the input received by BAYYA in order to better estimate how the signal will be perceived (see TREURNIET, column 2, lines 19-22).

However, BAYYA in view of TREURNIET do not disclose wherein each of the at least one measure of vocal quality are selected from the group consisting, of roughness hoarseness strain, and breathiness.

In the same field of speech quality measurement, DEAL discloses a method of measuring vocal roughness. DEAL teaches a measure of voice quality that is at least one of roughness and hoarseness ("provide a quantitative acoustic index predictive of

perceived vowel roughness", DEAL, p. 251, 4th paragraph, where vowel roughness is associated with voice roughness and hoarseness, see DEAL, p. 251, 2nd paragraph).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use the measurement method of DEAL as one of the distortion measures of BAYYA in order to increase the versatility of the quality measurement by determining vowel quality contained in a speech signal (see DEAL, page 250, last three lines of 1st paragraph), which would benefit the teachings of Bayya, which also suggests the determination of the naturalness of a speech signal. The incorporation of Deal enables the naturalness of individual components of the speech signal to be further analyzed for possible variability among speakers (see Deal page 250, Abstract).

11. Regarding **claim 3**, DEAL discloses a method of measuring vocal roughness. DEAL teaches a measure of voice quality that is at least one of roughness and hoarseness ("provide a quantitative acoustic index predictive of perceived vowel roughness", DEAL, p. 251, 4th paragraph, where vowel roughness is associated with voice roughness and hoarseness, see DEAL, p. 251, 2nd paragraph).

12. Regarding **claim 4**, DEAL further teaches that the one or more voice quality attributes of said voice signal include changes in pitch over time and changes in loudness over time ("acoustic measures of period and amplitude variation", DEAL, p. 251, 4th paragraph).

13. Regarding **claim 5**, DEAL further teaches that the one or more voice quality attribute of said voice signal includes a measure of partial loudness ("acoustic measures of… spectral noise level", DEAL, p. 251, 4th paragraph).

14. Regarding **claim 13**, DEAL discloses a method of measuring vocal roughness. DEAL teaches a measure of voice quality that is at least one of roughness and hoarseness ("provide a quantitative acoustic index predictive of perceived vowel roughness", DEAL, p. 251, 4th paragraph, where vowel roughness is associated with voice roughness and hoarseness, see DEAL, p. 251, 2nd paragraph).

15. Regarding **claim 14**, DEAL further teaches that the one or more voice quality attributes voice quality attributes of the test voice signal include changes in pitch over time and changes in loudness over time ("acoustic measures of period and amplitude variation", DEAL, p. 251, 4th paragraph).

16. Regarding **claim 15**, DEAL further teaches that the one or more voice quality attributes voice quality attribute of the test voice signal includes a measure of partial loudness ("acoustic measures of… spectral noise level", DEAL, p. 251, 4th paragraph).

17. Regarding **claim 23**, DEAL discloses a method of measuring vocal roughness. DEAL teaches a measure of voice quality that is at least one of roughness and

hoarseness ("provide a quantitative acoustic index predictive of perceived vowel roughness", DEAL, p. 251, 4th paragraph, where vowel roughness is associated with voice roughness and hoarseness, see p. 251, 2nd paragraph).

18. Regarding **claim 24**, DEAL further teaches that the one or more voice quality attributes voice quality attributes of the test voice signal include changes in pitch over time and changes in loudness over time ("acoustic measures of period and amplitude variation", DEAL, p. 251, 4th paragraph).

19. Regarding **claim 25**, DEAL further teaches that the one or more voice quality attributes voice quality attribute of the test voice signal includes a measure of partial loudness ("acoustic measures of… spectral noise level", DEAL, p. 251, 4th paragraph).

20. Regarding **claims 31**, **39, and 47**, BAYYA further teaches recording a voice signal (see col. 2, lines 54, microphone receives corrupted speech); generating a voice signal based on the recording of the speaker's voice (see col. 2, lines 53-54, A/D converter).

21. Regarding **claims 32**, **40, and 48**, BAYYA further teaches wherein the one or more baseline vocal quality attributes are derived from at least one baseline voice signal ("the speech reference vectors 16 are obtained from a large number of clean speech

samples", BAYYA, column 2, lines 57-58) (e.g. The reference and the distorted speech are compared. The baseline vocal quality is derived from reference signal, which is based on various speech references (see col. 2, lines 57-60). Vocal quality evaluated in terms of distortion (see col. 5, lines 28-34)).

22. Regarding **claims 33**, **41, and 49**, BAYYA further teaches wherein the one or more baseline vocal quality attributes are associated with at least one baseline measure of vocal quality of a human speaker (see col. 4, equation , where the cepstral coefficients are used in calculating a distortion measure between the input and reference).

23. Regarding **claims 34**, **42, and 50**, BAYYA further teaches wherein the at least one objective measure of voice quality of the voice signal defines a degree of vocal quality of the voice signal ("value between 1 and 5", BAYYA, column 5, line 6) relative to the at least one baseline measure of vocal quality of a human speaker ("the speech reference vectors 16 are obtained from a large number of clean speech samples", BAYYA, column 2, lines 57-58 and see col. 2, lines).

24. Regarding **claims 35**, **43, and 51**, BAYYA further teaches, wherein the at least one measure of voice quality is an objective measure of voice quality ("predicting the subjective scores corresponding to the quality of speech based on the objective measurements", BAYYA, column 4, lines 58-59).

25. Regarding **claims 36**, **44, and 52**, TREURNIET further teaches, wherein the auditory model is a transfer function corresponding to a human auditory system (see col. 4, lines 49-52, the peripheral ear model considers transfer characteristics and see col. 5, lines 26-37, especially equation shows a transfer function).

26. Regarding **claims 37**, **45, and 53**, TREURNIET wherein the auditory model is a transfer function corresponding to an outer portion and middle portion of a human ear (see col. 5, lines 28, models effect of the ear canal and middle ear), an excitation pattern elicited on a basilar membrane (see col. 5, lines 5-11, localized basilar energy representation), within a cochlea (see col. 5, lines 10-15, where the spectral energy is mapped to a pitch scale that is linear with respect to the properties of the inner ear and see col. 4, lines 8-12, where the energy propagates to inner ear in which the cochlea contains the basilar membrane), and transduction of the excitation pattern into neural activity in fibers of an auditory nerve (see col. 5, lines 20-25, where the basilar membrane representations are determined and see col. 4, lines 15-20, where the peripheral ear model is modeled to transducing to neural activity via hair cells and passed to the brain using the auditory nerve.).

27. Regarding **claims 38**, **46, and 54**, BAYYA teaches transmitting the voice signal through a communication channel (see col. 5, lines 47-54, where the speech signal is corrupted when received through from channel impairments or noise) prior to

processing the voice signal (see col. 5, lines 54-58, where the corrupted speech signal is then processed).

28. **Claims 6-10, 16-20, and 26-30** are rejected under 35 U.S.C. 103(a) as being unpatentable over BAYYA et al. (US 6,446,038) in view of TREURNIET et al. (Patent No.: US 7,164,771), in view of DEAL and in further view of HILLENBRAND et al. ("Acoustic Correlates of Breathy Vocal Quality").

29. Regarding **claim 6**, the combination of BAYYA in view of TREURNIET in view of DEAL teaches all of the claimed limitation of claim 1.

However, BAYYA in view of TREURNIET in view of DEAL do not disclose that the measure of voice quality is breathiness.

In the same field of speech quality measurement, HILLENBRAND discloses a method of measuring vocal breathiness. HILLENBRAND teaches a measure of voice quality that is breathiness ("acoustic measures in predicting breathiness ratings", HILLENBRAND, *abstract*).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use the measurement method of HILLENBRAND as one of the distortion measures of BAYYA in order to increase the versatility of the quality measurement and to include quality measurements that compare different speech signals with and without pathological conditions (see HILLENBRAND, page 311, Abstract)

30. Regarding **claim 7**, HILLENBRAND further teaches that the one or more voice quality attributes voice quality attribute of the test voice signal includes a measure of low frequency periodic energy (“aspiration noise is inherently weak in the low frequencies”, HILLENBRAND, p. 312, 2nd paragraph, meaning the low frequencies contain a strong periodic component).

31. Regarding **claim 8**, HILLENBRAND further teaches that the one or more voice quality attributes voice quality attribute of the test voice signal includes a measure of high frequency aperiodic energy (“periodic component of the voice source is inherently weak in the mid and high frequencies”, HILLENBRAND, p. 312, 2nd paragraph, meaning the mid and high frequencies contain a strong aperiodic component).

32. Regarding **claim 9**, HILLENBRAND further teaches that the one or more voice quality attributes voice quality attribute of the test voice signal includes a measure of partial loudness of a periodic signal portion of the test voice signal (“measure of the… average energy below 4 kHz”, HILLENBRAND, p. 315, 4th paragraph, where the low frequencies contain a periodic signal, see HILLENBRAND, p. 312, 2nd paragraph).

33. Regarding **claim 10**, HILLENBRAND further teaches that the one or more voice quality attributes voice quality attributes of the test voice signal include a measure of noise in the test voice signal and a measure of partial loudness of the test voice signal (“measure of the average spectral energy at or above 4 kHz to the average energy

below 4 kHz", HILLENBRAND, p. 315, 4th paragraph, where the high frequencies contain noise and the low frequencies contain a periodic signal, see HILLENBRAND, p. 312, 2nd paragraph).

34. Regarding **claim 16**, the combination of BAYYA in view of TREURNIET in view of DEAL teaches all of the claimed limitation of claim 11.

However, BAYYA in view of TREURNIET in view of DEAL do not disclose that the measure of voice quality is breathiness.

In the same field of speech quality measurement, HILLENBRAND discloses a method of measuring vocal breathiness. HILLENBRAND teaches a measure of voice quality that is breathiness ("acoustic measures in predicting breathiness ratings", HILLENBRAND, *abstract*).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use the measurement method of HILLENBRAND as one of the distortion measures of BAYYA in order to increase the versatility of the quality measurement and to include quality measurements that compare different speech signals with and without pathological conditions (see HILLENBRAND, page 311, Abstract)

35. Regarding **claim 17**, HILLENBRAND further teaches that the one or more voice quality attributes voice quality attribute of the test voice signal includes a measure of low frequency periodic energy ("aspiration noise is inherently weak in the low frequencies",

HILLENBRAND, p. 312, 2nd paragraph, meaning the low frequencies contain a strong periodic component).

36. Regarding **claim 18**, HILLENBRAND further teaches that the one or more voice quality attributes voice quality attribute of the test voice signal includes a measure of high frequency aperiodic energy (“periodic component of the voice source is inherently weak in the mid and high frequencies”, HILLENBRAND, p. 312, 2nd paragraph, meaning the mid and high frequencies contain a strong aperiodic component).

37. Regarding **claim 19**, HILLENBRAND further teaches that the one or more voice quality attributes voice quality attribute of the test voice signal includes a measure of partial loudness of a periodic signal portion of the test voice signal (“measure of the… average energy below 4 kHz”, HILLENBRAND, p. 315, 4th paragraph, where the low frequencies contain a periodic signal, see HILLENBRAND, p. 312, 2nd paragraph).

38. Regarding **claim 20**, HILLENBRAND further teaches that the one or more voice quality attributes voice quality attributes of the test voice signal include a measure of noise in the test voice signal and a measure of partial loudness of the test voice signal (“measure of the average spectral energy at or above 4 kHz to the average energy below 4 kHz”, HILLENBRAND, p. 315, 4th paragraph, where the high frequencies contain noise and the low frequencies contain a periodic signal, see HILLENBRAND, p. 312, 2nd paragraph).

39. Regarding **claim 26**, the combination of BAYYA in view of TREURNIET in view of DEAL teaches all of the claimed limitation of claim 1.

However, BAYYA in view of TREURNIET in view of DEAL do not disclose that the measure of voice quality is breathiness.

In the same field of speech quality measurement, HILLENBRAND discloses a method of measuring vocal breathiness. HILLENBRAND teaches a measure of voice quality that is breathiness ("acoustic measures in predicting breathiness ratings", HILLENBRAND, *abstract*).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use the measurement method of HILLENBRAND as one of the distortion measures of BAYYA in order to increase the versatility of the quality measurement and to include quality measurements that compare different speech signals with and without pathological conditions (see HILLENBRAND, page 311, Abstract).

40. Regarding **claim 27**, HILLENBRAND further teaches that the one or more voice quality attributes voice quality attribute of the test voice signal includes a measure of low frequency periodic energy ("aspiration noise is inherently weak in the low frequencies", HILLENBRAND, p. 312, 2nd paragraph, meaning the low frequencies contain a strong periodic component).

41. Regarding **claim 28**, HILLENBRAND further teaches that the one or more voice quality attributes voice quality attribute of the test voice signal includes a measure of high frequency aperiodic energy ("periodic component of the voice source is inherently weak in the mid and high frequencies", HILLENBRAND, p. 312, 2nd paragraph, meaning the mid and high frequencies contain a strong aperiodic component).

42. Regarding **claim 29**, HILLENBRAND further teaches that the one or more voice quality attributes voice quality attribute of the test voice signal includes a measure of partial loudness of a periodic signal portion of the test voice signal ("measure of the… average energy below 4 kHz", HILLENBRAND, p. 315, 4th paragraph, where the low frequencies contain a periodic signal, see HILLENBRAND, p. 312, 2nd paragraph).

43. Regarding **claim 30**, HILLENBRAND further teaches that the one or more voice quality attributes voice quality attributes of the voice signal include a measure of noise in the voice signal and a measure of partial loudness of the voice signal ("measure of the average spectral energy at or above 4 kHz to the average energy below 4 kHz", HILLENBRAND, p. 315, 4th paragraph, where the high frequencies contain noise and the low frequencies contain a periodic signal, see HILLENBRAND, p. 312, 2nd paragraph).

44. **Claims 56-58** are rejected under 35 U.S.C. 103(a) as being unpatentable over BAYYA et al. (US 6,446,038) in view of TREURNIET et al. (Patent No.: US 7,164,771),

in view of DEAL and in further view of HADJITODOROV et al. (“A computer system for acoustic analysis of pathological voices and laryngeal diseases screening”).

45. Regarding **claim 56-58**, the combination of BAYYA in view of TREURNIET in view of DEAL teaches all of the claimed limitation of claim 1.

However, BAYYA in view of TREURNIET in view of DEAL do not disclose that the measure of voice quality is strain.

In the same field of speech quality measurement, HADJITODOROV discloses a method of measuring vocal strain. HADJITODOROV teaches a measure of voice quality that is strain (“incomplete closure of the glottis”, HADJITODOROV, page 423, left column, sect. 2.4, where the laryngeal diseases associated with incomplete closure of glottis, formula TNI, which is used for the analysis).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use the measurement method of HADJITODOROV as one of the distortion measures of BAYYA in order to increase the versatility of the quality measurement (multidimensional nature of voice) and to include quality measurements that compare different speech signals with and without pathological conditions (see HADJITODOROV, page 421, left column, 1st full paragraph).

Conclusion

46. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Paras Shah whose telephone number is (571)270-1650. The examiner can normally be reached on MON.-THURS. 7:30a.m.-4:00p.m. EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, James Wozniak can be reached on (571)272-7632. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Paras Shah/
Examiner, Art Unit 2626

12/27/2010